UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/896,062	06/29/2001	Hong Wang	207496	9464

23460 7590 10/19/2004

LEYDIG VOIT & MAYER, LTD
TWO PRUDENTIAL PLAZA, SUITE 4900
180 NORTH STETSON AVENUE
CHICAGO, IL 60601-6780

EXAMINER	
LERNER, MARTIN	

ART UNIT	PAPER NUMBER
2654	

DATE MAILED: 10/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/896,062	WANG ET AL.	
	Examiner	Art Unit	
	Martin Lerner	2654	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 to 23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *23* is/are allowed.

6)☒ Claim(s) *1 to 3, 7, 10, and 17* is/are rejected.

7)☒ Claim(s) *4 to 6, 8 to 9, 11 to 16, and 18 to 22* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2/13/02 & 2/12/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 7 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 recites the limitation "after the step of calculating gains". There is insufficient antecedent basis for this limitation in the claim. Claim 7 should depend upon claim 4, not upon independent claim 1, as there is no antecedent basis for "after the step of calculating gains" for independent claim 1.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 to 3, 10, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Yeldener* in view of *Kabal et al. ("Adaptive Postfiltering for Enhancement of Noisy Speech in the Frequency Domain")*.

Concerning independent claim 1, *Yeldener* discloses a method of postfiltering a speech signal, comprising:

"generating a postfilter by performing a non-linear transformation of the linear predictive coefficients spectrum in the frequency domain" – frequency domain post-filtering is performed; the design of the frequency domain postfilter is taken to be $P_f(\omega)$, which is a non-linear power β ("performing a non-linear transformation") of the weighted spectral envelope $R_\omega(\omega)$, which depends upon LPC coefficients a_k (column 20, line 51 to column 21, line 25);

"applying the generated postfilter to the synthesized speech signal in the frequency domain" – the estimated postfilter frequency response is then used to weight the original speech envelope to give $H(\omega)$(bar), which causes the formant to narrow and reduces the depth of the formant nulls, thereby reducing the effects of noise (column 21, lines 33 to 41).

Concerning independent claim 1, the only element not expressly disclosed by *Yeldener* is "transforming the filtered frequency domain synthesized speech signal into a speech signal in the time domain." However, it is maintained that it is implicit that a frequency domain speech signal must be transformed back into the time domain to be audibly heard in *Yeldener*. *Kabal et al.* teaches adaptive postfiltering for enhancement of noisy speech in the frequency domain, where a frequency domain speech signal $X(k)$ from DFT of a time domain speech signal $x(n)$ is modified by LPC analysis to give $P(k)$ and $H(k)$, and then a frequency domain signal $Y(k)$ is transformed by IDFT back into a time domain signal $y(n)$. (3. Frequency-domain Postfiltering: Page 312: Figure 1) It

would have been obvious to one having ordinary skill in the art to transform the filtered frequency domain synthesized speech signal into the time domain as taught by *Kabal et al.* for the frequency domain post-filtering method of *Yeldener* because it is implicit that a frequency domain speech signal must be transformed into the time domain in order to be reproduced in an audible manner.

Concerning claim 2, *Yeldener* discloses "compensating the linear predictive coefficients spectrum using the computed tilt" – the first step in the design of the frequency domain postfilter is to weight the measured spectral envelope in order to remove the spectral tilt and produce an even, i.e. more flat spectrum; $H(\omega)$ is the spectral envelope of LPC coefficients a_k; spectral tilt in LPC coefficients a_k is compensated by coefficient γ, between 0 and 1 (column 20, lines 61 to 67).

Concerning claim 2, *Yeldener* does not expressly disclose "computing the tilt of the linear predictive coefficients spectrum". However, *Yeldener* teaches removing the spectral tilt (column 20, lines 61 to 67), so it is implicit that spectral tilt must first be computed to be removed. Generally, it is known that a value of a tilt correction coefficient γ must be obtained by first calculating the magnitude of the spectral tilt.

Concerning claim 3, *Kabal et al.* teaches applying a zero padding technique for $P(k)$ (3.4 Modification of $X(k)$ – Smooth Switching Algorithm: Page 314: Equations (2) to (4)).

Concerning independent claim 10, *Yeldener* discloses a method of postfiltering a speech signal, comprising:

"compensating the linear predictive coefficients spectrum using the computed tilt" – the first step in the design of the frequency domain postfilter is to weight the measured spectral envelope in order to remove the spectral tilt and produce an even, i.e. more flat spectrum; $H(\omega)$ is the spectral envelope of LPC coefficients a_k; spectral tilt in LPC coefficients a_k is compensated by coefficient γ, between 0 and 1 (column 20, lines 61 to 67);

"generating a postfilter by executing a non-linear transformation of the compensated linear predictive coefficients in the frequency domain" – frequency domain post-filtering is performed; the design of the frequency domain postfilter is taken to be $P_f(\omega)$, which is a non-linear power β ("executing a non-linear transformation") of the weighted spectral envelope $R_\omega(\omega)$, which depends upon LPC coefficients a_k (column 20, line 51 to column 21, line 25);

"applying the generated postfilter to the synthesized speech signal in the frequency domain" – the estimated postfilter frequency response is then used to weight the original speech envelope to give $H(\omega)$(bar), which causes the formant to narrow and reduces the depth of the formant nulls, thereby reducing the effects of noise (column 21, lines 33 to 41).

Concerning independent claim 10, the only element not expressly disclosed by *Yeldener* is "computing the tilt of the linear predictive coefficients spectrum". However, *Yeldener* teaches removing the spectral tilt (column 20, lines 61 to 67), so it is implicit

that spectral tilt must first be computed to be removed. Generally, it is known that a value of a tilt correction coefficient γ must be obtained by first calculating the magnitude of the spectral tilt. Thus, it would have been obvious to one having ordinary skill in the art to compute the tilt of the linear predictive coefficients spectrum in *Yeldener* because, implicitly, tilt must first be computed before it can be removed.

Concerning independent claim 17, *Yeldener* discloses an apparatus for postfiltering a speech signal, comprising:

"a Fourier transformation module operable for conducting a Fourier transformation" – frequency domain post-filtering is performed (column 20, line 51 to column 21, line 25); thus, implicitly, the original signal is initially transformed into the frequency domain;

"a formant filter comprising formant filter gains, wherein the gains are calculated in the frequency domain by performing a non-linear transformation of the linear predictive coefficients" – frequency domain post-filtering is performed; the design of the frequency domain postfilter is taken to be $P_f(\omega)$, which is a non-linear power β ("performing a non-linear transformation") of the weighted spectral envelope $R_\omega(\omega)$, which depends upon LPC coefficients a_k (column 20, line 51 to column 21, line 25); a frequency domain postfilter acts to weight the formants in the spectral envelope by a Wiener-type filter characteristic (column 21, lines 26 to 46: Figure 10C), and so is equivalent to "formant filter gains".

Concerning independent claim 17, the only element not expressly disclosed by *Yeldener* is "an inverse Fourier transformation module operable for conducting an inverse Fourier transformation." However, it is maintained that it is implicit that a frequency domain speech signal must be transformed back into the time domain to be audibly heard in *Yeldener*. *Kabal et al.* teaches adaptive postfiltering for enhancement of noisy speech in the frequency domain, where a frequency domain speech signal *X(k)* from DFT of a time domain speech signal *x(n)* is modified by LPC analysis to give *P(k)* and *H(k)*, and then a frequency domain signal *Y(k)* is transformed by IDFT back into a time domain signal *y(n)*. (3. Frequency-domain Postfiltering: Page 312: Figure 1) It would have been obvious to one having ordinary skill in the art to transform the filtered frequency domain synthesized speech signal into the time domain as taught by *Kabal et al.* for the frequency domain post-filtering method of *Yeldener* because it is implicit that a frequency domain speech signal must be transformed into the time domain in order to be reproduced in an audible manner.

Allowable Subject Matter

Claim 23 is allowed.

Claims 4 to 6, 8 to 9, 11 to 16, and 18 to 22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 7 would be allowable if rewritten to overcome the rejection under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to Applicants' disclosure.

Gao et al. discloses related art.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin Lerner whose telephone number is (703) 308-9064. The examiner can normally be reached on 8:30 AM to 6:00 PM Monday to Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on (703) 305-9645. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ML
10/14/04

Martin Lerner
Examiner
Group Art Unit 2654